



**American Water Works  
Association**

The Authoritative Resource on Safe Water®

ANSI/AWWA C302-11  
(Revision of ANSI/AWWA C302-04)

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*AWWA Standard*

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# Reinforced Concrete Pressure Pipe, Noncylinder Type



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6666 West Quincy Avenue  
Denver, CO 80235-3098  
T 800.926.7337  
www.awwa.org

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## Committee Personnel

The AWWA Standards Subcommittee on ANSI/AWWA C302, which reviewed and developed this standard, had the following personnel at the time:

Terri A. Tovey, *Chair*

H.H. Bardakjian, Consulting Engineer, Glendale, Calif.	(AWWA)
G.A. Davidenko, Northwest Pipe Company, Saginaw, Texas	(AWWA)
M.P. Murphy, Ameron International, Rancho Cucamonga, Calif.	(AWWA)
C.C. Sundberg, CH2M HILL, Issaquah, Wash.	(AWWA)
T.A. Tovey, CH2M HILL, Bellevue, Wash.	(AWWA)

The AWWA Standards Committee on Concrete Pressure Pipe, which reviewed and approved this standard, had the following personnel at the time of approval:

Wayne R. Brunzell, *Chair*

Richard E. Lawhun, *Secretary*

### *General Interest Members*

H.H. Bardakjian, Consulting Engineer, Glendale, Calif.	(AWWA)
W.R. Brunzell, Brunzell Associates Ltd., Skokie, Ill.	(AWWA)
D. Dechant, Dechant Infrastructure Service, Aurora, Colo.	(AWWA)
L.B. Freese, Freese & Nichols Inc., Fort Worth, Texas	(AWWA)
J.K. Haney, HDR Engineering Inc., Austin, Texas	(AWWA)
R.Y. Konyalian, Consulting Engineer, Huntington Beach, Calif.	(AWWA)
F.S. Kurtz,* Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
S.A. McKelvie,† HDR Engineering Inc., Boston, Mass.	(AWWA)
T.L. Niemann, Elizabeth Niemann & Associates, Louisville, Ky.	(AWWA)
J.J. Roller, CTL Group, Skokie, Ill.	(AWWA)
A.E. Romer, AECOM, Newport Beach, Calif.	(AWWA)
C.C. Sundberg,† CH2M HILL, Issaquah, Wash.	(AWWA)

---

\* Liaison, nonvoting

†Alternate

T.A. Tovey, CH2M HILL, Bellevue, Wash. (AWWA)  
M.S. Zarghamee, Simpson Gumpertz & Heger Inc., Waltham, Mass. (AWWA)

*Producer Members*

J.O. Alayon, Atlantic Pipe Corporation, San Juan, P.R. (AWWA)  
S.A. Arnaout, Hanson Pressure Pipe Inc., Dallas, Texas (AWWA)  
G. Bizien,\* Hanson Pressure Pipe Inc., St. Eustache, Que. (AWWA)  
K.M. Brown, Vianini Pipe Inc., Somerville, N.J. (AWWA)  
G.A. Davidenko, Northwest Pipe Company, Saginaw, Texas (AWWA)  
B.D. Keil,\* Northwest Pipe Company, Pleasant Grove, Utah (AWWA)  
R.E. Lawhun, American Concrete Pressure Pipe Association, Fairfax, Va. (ACPPA)  
M.P. Murphy, Ameron International, Rancho Cucamonga, Calif. (AWWA)  
J.A. Tully, Munro Concrete Products Ltd., Utopia, Ont. (AWWA)

*User Members*

D.T. Bradley,† Standards Council Liaison, Oak Lodge Water District, Portland, Ore. (AWWA)  
K.A. Danley, Des Moines Water Works, Des Moines, Iowa (AWWA)  
W.C. Duke, Bureau of Reclamation, Denver, Colo. (USBR)  
J. Galleher Jr., San Diego County Water Authority, Escondido, Calif. (AWWA)  
J.G. Grunow, Louisville Water Company, Louisville, Ky. (AWWA)  
D.H. Marshall, Tarrant Regional Water District, Fort Worth, Texas (AWWA)  
N.A. Wigner, Los Angeles Dept. of Water & Power, Los Angeles, Calif. (AWWA)

---

\* Alternate

† Liaison, nonvoting

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## Foreword

*This foreword is for information only and is not a part of ANSI/AWWA C302.*

### **I. Introduction.**

I.A. *Background.* Reinforced concrete pressure pipe of the noncylinder type has been used extensively since the turn of the century. This type of pipe is made with one or more cages of steel reinforcing bars or wire encased in concrete. The concrete is usually placed by vertical or centrifugal casting methods. Rubber-gasketed joints may have either steel or concrete bell and spigot surfaces. The pipe is manufactured in sizes ranging from 12 in. (300 mm) to more than 144 in. (3,660 mm) in diameter and is generally made in 8-ft (2.5-m) through 24-ft (7.5-m) laying lengths.

Reinforced concrete pressure pipe, noncylinder type, is designed for the specific combination of internal pressure and external load required for a project, in accordance with the procedures outlined in AWWA Manual M9, *Concrete Pressure Pipe*. This pipe is normally limited in working pressure to a maximum of 55 psi (380 kPa) and is used for low-pressure transmission lines in irrigation, industrial and domestic water supply systems, and other applications (see Section III).

Design criteria and examples along with installation recommendations and other related data pertaining to this pipe are covered in AWWA Manual M9.

I.B. *History.* In April 1943, the AWWA Board of Directors authorized the preparation of "Tentative Emergency Specifications for Concrete Pressure Pipe." These tentative specifications, which covered several types of pipe in a single document, served a useful purpose during World War II but are now obsolete and have been withdrawn.

The first edition of this standard was approved as tentative on Sept. 4, 1951, and made a standard on May 5, 1953. The second edition was made a standard on July 19, 1957. Substantial changes, including the addition of limiting stresses for combined loading design, were incorporated into the third edition, which was made a standard on Jan. 27, 1964.

The fourth edition, dated Jan. 28, 1974, included several significant changes. Format and terminology were modified to generally conform to ANSI/AWWA C301, Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids, and section titles were added. The scope of sizes was changed to include 12-in. (300-mm) through 144-in. (3,660-mm) pipe with certain length restrictions as

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\* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

a function of diameter. Provisions for concrete admixtures were included along with modifications of curing parameters. Design requirements and reference appendixes were added.

The fifth edition, dated June 14, 1987, included general format changes and several minor technical revisions for aggregates. Provisions for pozzolanic materials as a cement replacement under controlled conditions were introduced. Maximum levels for soluble chloride ion ( $\text{Cl}^-$ ) content in the concrete mix were established. The criteria for curing the pipe were upgraded.

The sixth edition, dated Jan. 22, 1995, was rewritten to reflect the current AWWA standard style. The yield strength and testing frequency of steels was specified. Requirements for spacing of circumferential reinforcement and cage placement supports were added, and requirements for rubber gaskets were expanded. The minimum pipe wall thickness requirements were extended for pipe sizes up to 144 in. (3,660 mm). A section on the design of fittings was added. The design procedures for this pipe that had been in appendix A were moved to AWWA Manual M9.

This edition was approved by the AWWA Board of Directors on Jan. 23, 2011.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (AwwaRF, now Water Research Foundation\*) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.<sup>†</sup> Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.

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\* Water Research Foundation, 6666 W. Quincy Ave., Denver, CO 80235.

† Persons outside the United States should contact the appropriate authority having jurisdiction.

3. Two standards developed under the direction of NSF, NSF\*/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,<sup>†</sup> and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 61 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C302 does not address additives requirements. Users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.
2. Determine the status of certifications by all parties offering to certify products for contact with or treatment of drinking water.
3. Determine current information on product certification.

**II. Special Issues.** Special issues are addressed in AWWA Manual M9, *Concrete Pressure Pipe*.

**III. Use of This Standard.** It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives.* The following information should be provided by the purchaser:

1. Standard used, that is, ANSI/AWWA C302, Standard for Reinforced Concrete Pressure Pipe, Noncylinder Type, of latest revision.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.

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\* NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

† Both publications available from National Academy of Sciences, 500 Fifth Street, N.W., Washington, DC 20001.

3. If submission of manufacturer's design calculations for approval before manufacturing any pipe will be required.
4. Details of other federal, state or provincial, and local requirements (Section 4).
5. The working pressure, surge pressure, field test pressure, depth and weight of earth cover, trench bedding condition, and live load for which the pipe is to be designed (Sec. 4.2.2).
6. If the manufacturer is not permitted to supply pipe from inventory (Sec. 4.3.1).
7. If detailed drawings and schedules are to be submitted for review (Sec. 4.3.1 and Sec. 4.7.1).
8. If a tabulated layout schedule will be required (Sec. 4.3.2).
9. Type of cement required, if there is a preference (Sec. 4.4.1.1).
10. If submission of the type and amount of admixtures will be required (Sec. 4.4.5).
11. If either steel or concrete bell-and-spigot joint, or double spigot-and-sleeve joint of steel and concrete will be required (Sec. 4.5.3.1).
12. If submission for approval of welder qualification (Sec. 4.6.2) and welding procedure specifications (Sec. 4.6.3) will be required.
13. Fittings details (Sec. 4.7.1).
14. If the purchaser desires to inspect the material, pipe, and fittings at the manufacturer's plant (Sec. 5.1.1).
15. If any material or manufacturing test reports will be required (Sec. 5.1.2).
16. If steel test specimens will be required (Sec. 5.2.3).
17. If welds in reinforcements will be required (Sec. 5.2.5).
18. If hydrostatic pressure testing of pipe at the manufacturer's yard will be required (Sec. 5.3.1).
19. If an affidavit of compliance will be required (Sec. 6.3).

III.B. *Modification to Standard.* Any modification to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

**IV. Major Revisions.** Major revisions made to the standard in this edition include the following:

1. A provision that materials shall comply with the requirements of the Safe Drinking Water Act and other federal regulations has been added (Sec. 4.4).
2. Material provisions for steel for fittings, steel reinforcement, and steel for joint rings have been modified (Sec. 4.4.6, Sec. 4.4.7, and Sec. 4.4.8).
3. For design of pipe (Sec. 4.5.2), provisions for radial tension and shear have been added (Sec. 4.5.2.1).
4. Provisions for joints have been updated (Sec. 4.5.3).

5. Provisions for concrete cover and reinforcement tolerances have been modified (Sec. 4.6.4.3).

**V. Comments.** If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services at 303.794.7711, FAX 303.795.7603, or write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at [standards@awwa.org](mailto:standards@awwa.org).

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**American Water Works  
Association**

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*AWWA Standard*

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# **Reinforced Concrete Pressure Pipe, Noncylinder Type**

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## **SECTION 1: GENERAL**

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### **Sec. 1.1 Scope**

This standard describes the manufacture of circumferentially reinforced concrete pressure pipe, without a steel cylinder and not prestressed, in sizes from 12 in. to 144 in. (300 mm to 3,660 mm) inclusive and for working pressures not exceeding 55 psi (380 kPa) and working plus surge pressures not exceeding a total pressure of 65 psi (450 kPa). This type of pipe is designed for the internal pressure, external loads, and bedding conditions designated by the purchaser. Pipe of diameters larger than 144 in. (3,660 mm) have been manufactured based on the concepts of this standard. This standard does not include requirements for design, handling, delivery, laying, field testing, or disinfection of pipe. See AWWA Manual M9, *Concrete Pressure Pipe*, for information on these topics.

1.1.1 *Essential requirements.* The pipe shall have the following principal features: a reinforcing cage or cages of steel bars, wire, or welded wire reinforcement; with concrete cover on each side of each reinforcing cage; and a joint with a preformed rubber gasket(s) of circular cross section, designed so that the joint will be watertight under the conditions of service specified by the purchaser.